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Serological survey of *Brucella abortus* antibody prevalence in the one-humped camel (*Camelus dromedarius*) from Eastern Sudan

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YAGOUB (I.A.), MOHAMED (A.A.), SALIM (M.O.). Enquête sérologique sur la prévalence des anticorps contre *Brucella abortus* chez le dromadaire (*Camelus dromedarius*) à l'est du Soudan. *Revue Élev. Méd. vét. Pays trop.*, 1990, 43 (2) : 167-171

Durant cinq ans, une enquête sur la prévalence des anticorps dirigés contre *Brucella* dans les sera de camélidés a été effectuée chez 1 502 dromadaires des deux sexes et d'âges différents. Le taux d'incidence moyen de réactions positives était de $6,95 \pm 1,55$ p. 100. Parmi les animaux adultes, le taux était de $4,94 \pm 2,51$ p. 100 chez les mâles et de $13,76 \pm 4,41$ p. 100 chez les femelles. Les jeunes mâles ont montré un taux de 0 p. 100 et les jeunes femelles un taux de $1,82 \pm 3,64$ p. 100. La présence d'anticorps dirigés contre *Brucella abortus* s'est révélée prédominante dans les sera des dromadaires durant les cinq années de l'enquête avec un taux d'incidence de 6,54, 5,79, 9,32, 5,03 et 8,06 p. 100 de 1985 à 1989 respectivement. **Mots clés :** Dromadaire - Anticorps - *Brucella abortus* - Sérologie - Enquête pathologique - Soudan.

Introduction

Human brucellosis in the Kassala area has been recognized since 1908 (12). The occurrence of the disease in cattle, sheep and goats in Sudan was suspected as in early as in 1904 when the first human case was confirmed (5). *Brucella abortus* was isolated for the first time from a dairy farm in the vicinity of Khartoum (5), while *B. melitensis* was isolated from goat milk when several cases of undulant fever had been reported among European residents in the Gezira area (8). Following isolation of these two species, the disease has frequently been described in different districts of the country (1, 4, 9, 10, 16).

The incidence of brucellosis in the one-humped camel from Sudan was first reported in 1971 (15). The authors examined 310 one-humped camel sera from the Kassala Province and Butana area. The results of their tube agglutination tests revealed an incidence rate of 1.75 and 5.7 %, respectively for the two districts. Thus, an overall incidence rate of 4.9 % *Brucella* antibodies in one-humped camels of both sexes from three regions was detected (2). The highest rate was 7.5 % in the Eastern region followed by 3.1 % in Darfur and 2 % in the central region. Except for these two

separate surveys, no research work or investigation has been conducted in one-humped camels. However, while screening the domestic livestock for the incidence of brucellosis in Saudi Arabia, AHMED *et al.* (3) examined 58 one-humped camels sacrificed in Makkah during the Hajj season in 1977, 48 of which were imported Sudanese one-humped camels. The incidence rate of brucellosis among the Sudanese one-humped camels was 4.2 % versus 2.8 % for the local ones.

The study of one-humped camel brucellosis in Eastern Sudan is of particular zoonotic importance since their milk is consumed as raw milk by nomadic owners. Moreover, many cases of late abortions in one-humped camel cows were regularly reported to the Regional Veterinary Research Laboratory. This survey was conducted in one-humped camels herds around the Kassala, El Gadarif, New Halfa and Aroma areas to monitor the incidence of brucellosis during a five year period starting from 1985 to 1989.

Materials and methods

The total number of one-humped camels sampled in this survey was 1 502. Among adult one-humped camels, there were 1 153 males and 270 females, while among the juvenile ones, there were 50 males and 29 females. With regard to sex, there were 1 203 male one-humped camels (adult + juvenile), while there were only 299 females. Serum samples were obtained by centrifugation of coagulated blood collected from the jugular vein in plain vacutainer tubes. Age, sex and geographical origin of samples were recorded. The animals belonged to the major one-humped camel owning tribes (Hadandawa, Beni Amir, Rashida and Shukria) in Eastern Sudan. One-humped camels visiting the main Veterinary Clinics at Kassala, El Gadarif, New Halfa and Aroma during 1985 to 1989 were also sampled.

The surveyed one-humped camels were divided according to age into four groups (Table I) consisting of adult males, adult females, juvenile males and juvenile females (1 month to 5 years). Their sera were tested for antibodies against *B. abortus* by the Standard Rose Bengal Plate Test (RBPT). The antigen used in this test was prepared in the central Veterinary Research Laboratory (SOBA) from *B. abortus* strain 99. The test was performed according to the method described in the Manual of Brucellosis Diagnosis Standard Laboratory Techniques (6).

Results

The incidence rate of positive reactions to *B. abortus* was 6.54, 5.79, 9.32, 5.03 and 8.06 %, respectively from 1985 to 1989 (Table I). The average ($X \pm SD$) incidence

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Reçu le 13.11.89, accepté le 2.01.90.

TABLE I The incidence of brucellosis — according to age and sex — in 1502 camels tested during 1985 to 1989.

Year	1985				1986				1987				1988				1989				Overall incid. rate				
Age Sex	No. tested	No. +ve	No. ±ve	Incid. rate (%)	No. tested	No. +ve	No. ±ve	Incid. rate (%)	No. tested	No. +ve	No. ±ve	Incid. rate (%)	No. tested	No. +ve	No. ±ve	Incid. rate (%)	No. tested	No. +ve	No. ±ve	Incid. rate (%)	Total	+ve	±ve	%	Average ± SD
AM	160	6	0	3.75	505	29	0	5.74	228	21	1	9.21	137	6	2	4.38	123	2	0	1.63	1 153	64	3	5.55	4.94 ± 2.51
AF	47	8	0	17.02	96	8	0	8.33	38	5	1	13.16	20	2	0	10.00	69	14	0	20.29	270	37	1	13.70	13.76 ± 4.41
JM	3	9	0	0.00	27	0	0	0.00	10	0	0	0.00	2	0	0	0.00	8	0	0	0.00	50	0	0	0.00	0.00 ± 0.00
JF	4	0	0	0.00	11	0	1	0.00	3	0	0	0.00	0	0	0	0.00	11	1	0	9.09	29	1	1	3.45	1.82 ± 3.64
Total	214	14	0	6.54	639	37	1	5.79	279	26	2	9.32	159	8	2	5.03	211	17	0	8.06	1 502	102	5	6.79	6.95 ± 1.55

AM : adult male ; AF : adult female ; JM : juvenile male ; JF : juvenile female.
+ ve : positive ; ±ve : doubtful.

rate for all one-humped camels was 6.95 ± 1.55 %. Adult male one-humped camels had an incidence rate of 4.94 ± 2.51 %, while this rate was 13.76 ± 4.41 % in adult females. Juvenile one-humped camel calves had a 0 % incidence rate in males and a 1.82 ± 3.64 % in females.

The ratio of positive reactions to *B. abortus* among adult one-humped camels versus the total number of adult camels (male + females) was 101/1 423, equal to an overall incidence rate of 7.1 %. For juvenile one-humped camels, the ratio was 1/79 and the overall incidence rate was 1.27 %. The ratio for all male one-humped camels (adult + juvenile) showing positive reactions to *B. abortus* was 64/1 203 (5.32 %), while for the total number of female (adult + juvenile), this ratio was 38/299 (12.71 %). The highest incidence rate (20.29 %) was recorded among female one-humped camels examined in 1989.

Discussion

Because of the nature and beliefs of the nomadic one-humped camel owners in this region of the country, adult male one-humped camels constituted the majority of the animals examined in this survey. These nomads usually resisted having their one-humped camels bled, especially females and young one-humped camel calves. They believed that bleeding females, even under strict hygienic conditions would result in harmful effects like abortion, loss of condition and disease transmission.

Positive reactions to *Brucella* in one-humped camels from the neighbouring countries have been claimed by different authors. For example, the Egyptian one-humped camels examined in 1948 (14) and 1963 (11) were shown to have a 14 and 10.2 % positive reaction rate, respectively. Similarly, a 14 % positive reaction

rate was recorded for Kenyan one-humped camels (19). The Nigerian one-humped camels presented for slaughter at the Kano abattoir showed a low (1 %) incidence rate of brucellosis (18). Milk samples from Tunisian one-humped camels tested in 1975 (7) were found negative for *Brucella* antibodies although 5.8 % of the one-humped camel sera had antibodies against *B. abortus* and 3.8 % against *B. Melitensis*.

The results of the present survey indicate that antibodies against *B. abortus* were prevalent in one-humped camel sera from Eastern Sudan (Fig. 1). These results are supported by the findings of MUSTAFA *et al.* (15) who recorded a 1.75 % incidence rate of brucellosis among one-humped camels from the Kassala province and further by the recent data of ABU DAMIR *et al.* (2) in which the highest percentage of positive reactions (7.5 %) was shown in one-humped camel sera from Eastern Sudan. The incidence rate was nearly constant throughout the five years of the survey except for the third year which showed a relatively higher rate (9.32 %). This high rate was likely due to intensive mixed grazing of cattle, sheep, goat and one-humped camels with sorghum by-products during the last year of the drought (1984-1987). It appeared that antibodies against *B. abortus* were prevalent in both adult males (4.94 %) and adult females (13.76 %), but the incidence rate was always higher in the females. This finding seems not to agree with the results of ABU DAMIR *et al.* (2) who recorded the highest incidence rate in males (5.6 vs 4.5 %). On the other hand, the low incidence rate of brucellosis (1.27 %) in juvenile one-humped camel calves may possibly indicate that premature one-humped camels are relatively insusceptible to infection by *Brucella*.

The problem of late abortion is considered by many Sudanese veterinarians as being caused by acute trypanosomosis due to *T. evansi* infections. Records of the Regional Veterinary Research Laboratory (Kassala) showed that over 20 % of one-humped camels in

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Fig. 1 : Eastern Region of the Sudan.

this region were infected with *T. evansi*. HIGGINS (13) stated that pregnant dromedaries may abort because of *T. evansi* infection. The trypanosome was also shown to cause abortion in buffaloes in Thailand (16). When considering *B. abortus* as a possible cause of abortion, the high incidence rate of *B. abortus* antibodies in the sera, in the complete absence of vaccination, was a strong circumstantial evidence for the existence of brucellosis. Despite this fact, the aetiology of abortion in nomadic one-humped camels is still unclear. These abortions could be due to *T. evansi* as previously stated, or to *B. abortus*, or to both pathogens.

Conclusion

Antibodies to *B. abortus* are prevalent in one-humped camel sera from Eastern Sudan. The high incidence

rate of positive reactions to *B. abortus* indicates that this species of bacteria could possibly be the direct cause of abortion in pregnant female one-humped camels. Research work needs to be undertaken in nomadic dromedaries to ascertain the prevalence of brucellosis, the species of bacteria present and to assess the veterinary and public health hazards.

Acknowledgements

The authors gratefully acknowledge the technical assistance of Miss ZEINAB A. MOHAMED. The article is published with the kind permission of the Permanent Under Secretary, Ministry of Animal Resources and of the Director of Veterinary Research Administration.

YAGOUR (I.A.), MOHAMED (A.A.), SALIM (M.O.). Serological survey of *Brucella abortus* antibody prevalence in the one-humped camel (*Camelus dromedarius*) from Eastern Sudan. *Revue Élev. Méd. vét. Pays trop.*, 1990, 43 (2) : 167-171.

A five year investigation of *Brucella* antibody prevalence in camel sera was conducted in 1502 one-humped camels of both sexes and different ages. The average ($X \pm SD$) incidence rate of positive results was 6.95 ± 1.55 %. Among adult one-humped camels, the rate was 4.94 ± 2.51 % in males and 13.76 ± 4.41 % in females. Juvenile one-humped camel calves showed a 0 % incidence rate in males and a 1.82 ± 3.64 % in females. Antibodies against *Brucella abortus* were prevalent in one-humped camel sera throughout the five years of the survey with incidence rates of 6.54, 5.79, 9.32, 5.03 and 8.06 %, respectively from 1985 to 1989. **Key words** : One-humped camel - Antibody - *Brucella abortus* - Serological survey - Sudan.

References

1. ABDULLA (A.). Incidence of animal brucellosis in Wadi Halfa district. *Sudan J. vet. Sci. Anim. Husb.*, 1966, 7 : 28-31.
2. ABU DAMIR (H.), KENYON (S.J.), KHALAF ALLA (A.E.), IDRIS (O.F.). Brucellosis antibodies in Sudanese camels. *Trop. Anim. Hlth Prod.*, 1984, 16 (4) : 209-212.
3. AHMED (I.R.), JOSEPH (A.A.), WAYNE (M.F.), SAAD (I.B.), ABDULLAH (A.A.). Incidence of brucellosis in domestic livestock in Saudi Arabia. *Trop. Anim. Hlth Prod.*, 1983, 15 : 139-143.
4. BAKHIET (M.). Brucellosis in cross-bred cattle. *Sudan J. vet. Res.*, 1981, 3 : 119-120.
5. BENNETT (S.G.). Annual report of the Sudan Veterinary Service. 1943 : 29-32.
6. Brucellosis diagnosis standard laboratory techniques. 2nd ed. Tolcarne Drive, Pinner, Middlesex England, Ministry of Agriculture, Fisheries and Food, 1981.
7. BURGEMEISTER (R.), LEYK (W.), GOSSLER (R.). Untersuchungen über vorkommen von parasitosen, bakteriellen und viralen infektionskrankheiten bei dromedaren in Südtunesien. *Dt. tierärztl. Wschr.*, 1975, 82 : 352-354.
8. DAFALLA (E.N.), KHAN (A.). The occurrence, epidemiology and control of animal brucellosis in the Sudan. *Bull. epizoot. Dis. Afr.*, 1958, 6 : 243-247.
9. EL NASRI (M.). Brucellosis in Southern Sudan. *Vet. Rec.*, 1960, 72 : 1200-1201.

10. HABIBALLA (N.). The incidence of bovine brucellosis in five dairies and two livestock improvement centres in the Sudan. *Sudan J. vet. Sci. Anim. Husb.*, 1977, **18** : 47-50.
11. HAMADA (S.), EL-HIDAK (M.), SHERIF (I.), EL-SAWAH (H.), YOUSEF (M.). Serological investigation on brucellosis in cattle, buffaloes and camels. *J. Arab. vet. med. Ass.*, 1963, **23** : 173-178.
12. HASEEB (M.A.). Undulant fever in the Sudan. *J. trop. Med. Hyg.*, 1950, **53** : 241-244.
13. HIGGINS (A.J.). Observation on the diseases of the Arabian camel (*Camelus dromedarius*) and their control. *Vet Bull.*, 1983, **53** (12) : 1089-1100.
14. KAZI (R.). Brucellosis among ewes, camels and pigs in Egypt. *J. comp. Path.*, 1948, **58** : 145-159.
15. MUSTAFA (A.A.), AWAD EL-KARIM (M.H.). A preliminary survey for the detection of *Brucella* antibodies in camel sera. *Sudan J. vet. Sci. anim. Husb.*, 1971, **12** (1) : 5-8.
16. MUSTAFA (A.A.), HASSAN (F.A.). Brucellosis in the Sudan. In : Proceedings of the 4th Veterinary conference. *Sudan J. vet. Sci. anim. Husb.*, 1969, **9** : 319-327.
17. LÖHR (K.F.), PJOLPARK (S.), LEESIRKUL (N.S.), SRIKIT-JAKAN (L.), STAAK (C.). *Trypanosoma evansi* infection in buffaloes in north-east Thailand. II : Abortions. *Trop. Anim. Hlth Prod.*, 1986, **17** : 103-108.
18. OKOH (A.E.J.). A survey of brucellosis in camels in Kano, Nigeria. *Trop. Anim. Hlth. Prod.*, 1979, **11** : 213-214.
19. WAGHELA (S.), FAZIL (M.A.), GATHUMA (J.M.), KAGU-NYA (D.K.). A serological survey of brucellosis in camels in north-eastern province of Kenya. *Trop. Anim. Hlth Prod.*, 1978, **10** : 28-29.